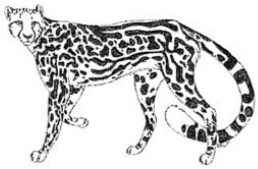

A PRELIMINARY, COMPARATIVE TYPE PROPOSAL FOR LARGE, UNIDENTIFIED MARINE AND FRESHWATER ANIMALS

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ABSTRACT
In a previous work proposing unidentified marine animal types based on a database analysis of observations, the author suggested a comparison of proposed, scientifically undescribed marine animals to unidentified lake animals may advance the data set of each (Champagne, 2001). After reviewing the generic descriptions of 163 unidentified freshwater, or suspected euryhaline aquatic animals, the author suggests that forms of more frequently observed, although scientifically unclassified, freshwater animals may be migratory, transient, or resident variants of the author's marine proposal, the Type III Multiple Humped Animal. The author suggests the Type III Multiple Humped Freshwater Animal proposal is falsifiable and can be utilised and compared to subsequent observations and a planned observation database analysis, and potentially maximise limited observational opportunities and/or assist with a type specimen collection.

Keywords: sea serpents, lake monsters, cryptozoology

INTRODUCTION

The author preliminarily reviewed 163 independent, summarised descriptions of unknown freshwater animals, sometimes referred to "lake monsters", and six descriptions of animals observed in both marine and freshwater environs throughout the world. The author noted that two types of his previously-proposed unidentified marine animal types appeared similar to some unknown freshwater and inland aquatic animals. The apparent similarities not only initially extended to possible morphology, but also to potential behavioural and geographical factors.

The author was not the first to suggest a possible correlation between currently unknown marine and freshwater animals, sometimes referred to as "sea serpents" and "lake monsters" respectively. Other researchers have also commented on a possible similarity (Costello, 1974; LeBlond and Bousfield, 1995), perhaps featuring a creature similar to Heuvelmans's long necked pinniped proposal (1968) (Fig. 1).

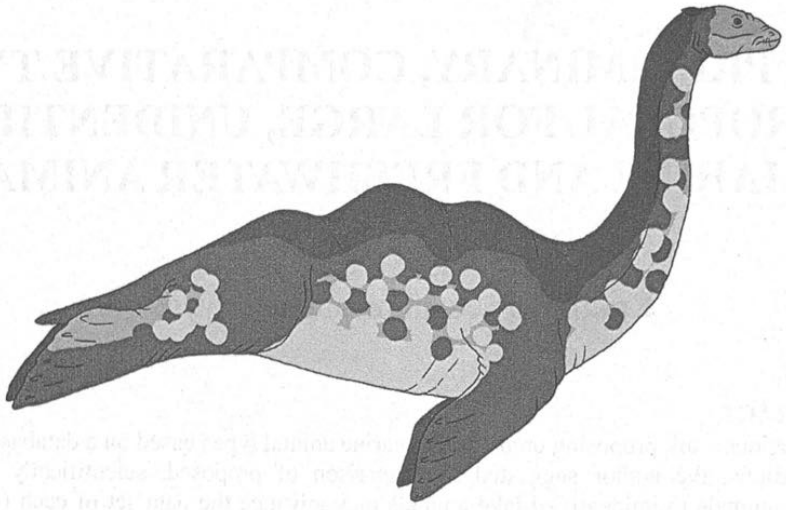


Fig. 1: Artistic representation of Heuvelmans's proposed long-necked seal (© Tim Morris)

Oudemans (1892), and later Costello (1974), suggested the unidentified animal in Scotland's Loch Ness, informally referred to as "Nessie", was a freshwater form of long necked/long-tailed seal. Olsson (1899) suggested a similar proposal for the animal observed in Sweden's Lake Storsjön, with Rafinesque-Schmaltz (1819) suggesting a connection between sea snakes and the unidentified animal reported in North America's Lake Erie. Although Harrison (2001) believes that these currently unknown marine and freshwater forms should not be combined when referencing unidentified lake animals in the British Isles, Shuker (1996) suggested some unidentified freshwater animals may be similar to the marine types of the same general area but are not likely the same species, although presumably closely related.

Coleman and Huyghe (2003) opined that there have been no serious attempts to classify the lake monsters reported around the world because, in part, they are believed to be of a singular nature or type - some form of "long-necked" animal. They also suggest that the majority of any scientific interest appeared to revolve around "piecemeal" attempts to identify the animals. Encouragingly, LeBlond and Bousfield (1995) acknowledged that some of the unidentified marine animal reports that they examined suggested some resemblance to lake forms, and proposed that the study of unidentified freshwater animals may profit from data associated with the oceanic types.

Common arguments in support of or against the existence of relatively large, scientifically undescribed freshwater animals may be typically based on the presumption that the animals are apex predators, and on the population of, and size and metabolic relationships to, proposed required standing fish stocks as primary food sources (Sheldon and Kerr, 1972; Scheider and Wallace, 1973; Mangiacopra, 1992), or estimations of observational effort. Other, sometimes contradictory arguments may also be founded on a specific freshwater body's size, climate, geographical history, and/or access to the ocean. Although Coleman and Huyghe (2003) suggested that the longest traditions of potential lake monsters were from larger lakes, Harrison (2001) reported that he found no correlation between Scottish loch size and reports of reported lake monsters, whereas Radford and Nickell (2006) suggested that lake monster sightings merely corresponded to public interest.

GENERAL "LAKE MONSTER" REVIEW OF DISTRIBUTION AND DESCRIPTION

The author examined general descriptions of the more notable "lake monsters" where there appears to be reasonable agreement of morphology and behaviour.

It is probable that some unidentified lake animal reports have been hoaxes, misidentifications, and over-simplified descriptions of unknown, and sometimes legendary or mythological freshwater animals. Descriptions have included a long, cylindrical neck and/or a plesiosaurid body plan, or even a composite of this romantic long-necked type and the horizontally-oriented, lobed tail frequently reported with a serpentine form (Fig. 2). The author noted a similar condition when examining unknown marine serpents, and theorised that some descriptions were likely the same type of animal (Champagne, 2007).

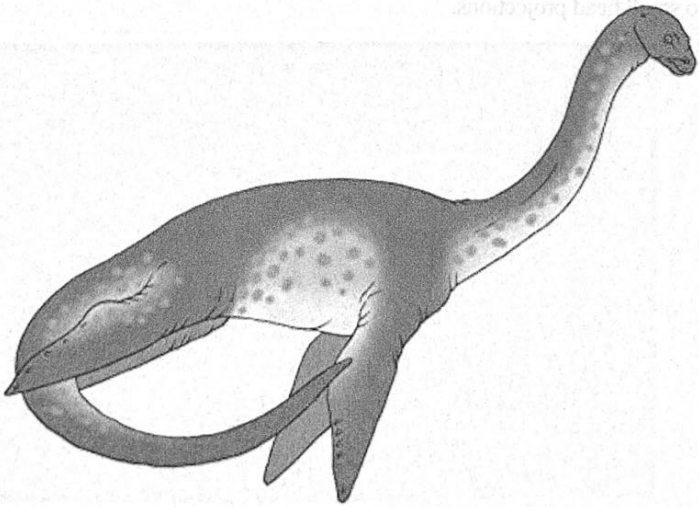


Fig. 2: Type 1A Long-Necked Animal (© Tim Morris)

Other researchers have also made a type distinction between various freshwater "monsters". Some of those examinations were based solely on behaviour (Kojo, 1992), whereas others were based on morphology and preferred environments (Watson, 2011).

There has also been some previous estimation of the distribution and potential habitat of these unidentified freshwater animals. Reporting on approximately one thousand alleged lake monster locations, Coleman (2001) also quoted Bernard Heuvelmans's observation: "Attention must drawn to the fact that all these long-necked animals [so-called "Lake Monsters"] have been reported from stretches of freshwater located at isothermic lines 10°C, that is, between 0°C and 20°C in both Northern and Southern hemispheres".

Mangiacopra (1992) identified the basic morphology, probabilities for existence, and potential population densities for some of the more frequently reported, unidentified freshwater animals in North American lakes. He found that the unidentified animal referred to as "Memphre", purported to inhabit Lake Memphremagog in Vermont and Quebec, Canada, has been described most frequently as a 7.6-9.4-m serpent with multiple humps, and secondarily with a horse-like head on an elongate, snake-like fish. Although Mangiacopra was unable to estimate a population size, he allowed for the animal's possible egress or migration or both from the lake.

North America's Lake Champlain is said to be the home of a scientifically-undescribed animal generically referred to as "Champ". Although the animal has been compared to Heuvelmans's marine "Super Otter" (Coleman, 2009) and a recent form of the middle Triassic, long-necked reptile *Tanystropheus longobardicus* (Hall, 2000; Elizabeth and Hall, 2014) (Fig. 3), the majority of sightings appear to describe a 4.6-9.2-m-long serpentine animal swimming, often perceptually very quickly, with 1-10 vertical undulations and humps (Kojo, 1991) and/or a snake-like or round head with two small head projections.

Fig. 3: Life-sized model of *Tanystropheus longobardicus* (© Karl P.N. Shuker)

Mardis (2015) has proposed that some Champ observations suggest the presence of not only the serpentine form but also a long necked form with a more plesiosaurid body plan. Unless Champ is capable of overland locomotion around two drainage obstructions (Kojo, 1991), Mangiacopra suggested this animal is the only lake monster candidate that could potentially be considered a homeotherm, with a population of up to ten individuals. Possibly supportive of a modern or relict cetacean proposal, von Muggenthaler recorded what she believes were echolocations in Lake Champlain in 2003 (von Muggenthaler *et al.*, 2010), although there is some disagreement that the echolocations are consistent with known cetaceans in pattern and cadence (Bartholomew, 2012).

Elizabeth (2014) has maintained the *Tanystropheus* (or analogue) proposal as being capable of echolocation as an evolutionary adaptation after recording possible echolocations in 2014. Based on an examination of observational distributions, Kojo (1992) suggested Champ to be primarily nocturnal and possibly dissimilar from other prominent lake "monsters".

"Ogopogo" reportedly inhabits Lake Okanagan in British Columbia, Canada. Generally, this unknown 6-12-m-long serpentine animal is described with 2-6 humps, a horse-like head, and a forked/fluked tail (Eberhart, 2002). As observational distributions are different from the proposed animal in Lake Champlain, and more similar to the animal in Loch Ness, Scotland, Kojo (1992) suggested Ogopogo to be diurnal and a different species from that reported in Lake Champlain. Mangiacopra (1992) concluded that if Ogopogo were mammalian, only three individuals could be environmentally supported as residents in the lake. Although Mackal (1980) proposed that Ogopogo may be a relict basilosaurid whale (Fig. 4), Bousfield suggested the animal was related to his proposed marine type, *Cadborosaurus willsi* (Eberhart, 2002).

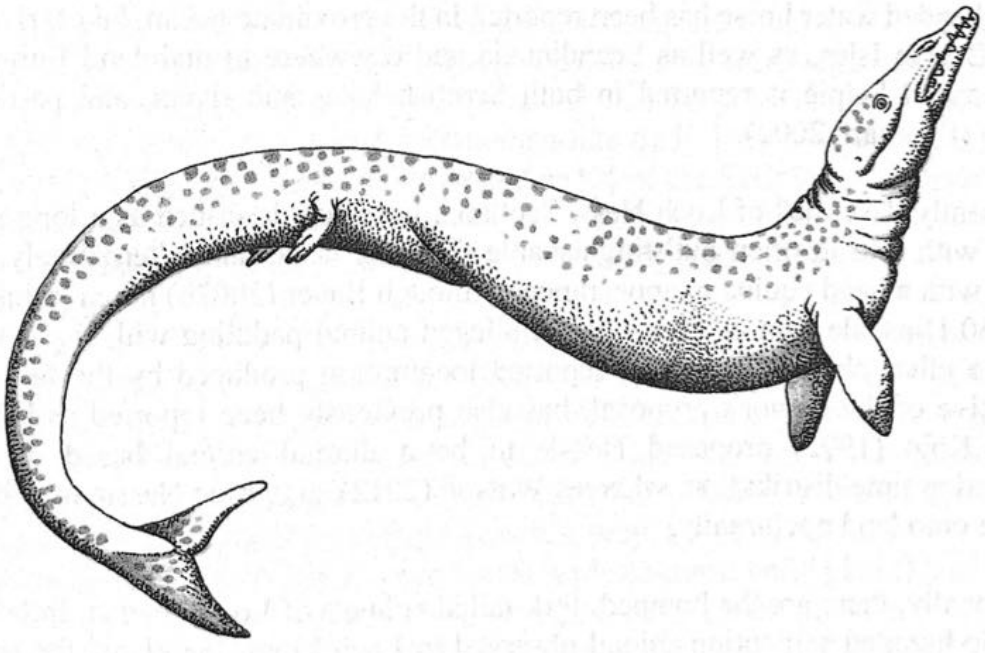


Fig. 4: Artistic reconstruction of a basilosaurid whale (© Tim Morris)

Frizzell (2001) made a size distinction between "Chessie" of the Chesapeake Bay area of North America, and the marine animal of the proximate coastal area, sometimes referred to as the "Great New England Sea Serpent" (O'Neill, 1999). Generically described as a 4-8-m-long serpentine animal, Chessie displays 3-4 humps, a turtle-like head, a 3-m-long neck, and has been reported swimming with both horizontal and vertical undulations (Eberhart, 2002). Frizzell (2001) also recounted reports of an unknown animal in the adjacent Choptank River and stories from watermen living in the swamps off Nanjemoy Creek of the animal "slithering through murky waters".

Lake Erie is the reported habitat of "South Bay Bessie", a 10-18-m-long serpentine animal with a long neck, 3-5 humps, and a flat tail (Eberhart, 2002). "Cressie", the unidentified animal of Crescent Lake in Newfoundland, has been identified as a 6-m eel-like animal and occasionally described with a horse-like head. Named after the river of southeastern Georgia in which it has been observed, the "Altamaha-Ha" is reported as a serpentine animal, 3-5 m in length, with a small head, long neck, and 2-3 humps displayed (Eberhart, 2002).

Other unknown North American animals have included observations of an unidentified animal entering the estuarine St. Croix River in Maine with the incoming tide, an unidentified animal in the St. Johns River of Florida, and the multiple-humped animal observed in the Sacramento River of California, approximately 113 km inland from the San Francisco Bay (Champagne, 2007).

The United Kingdom is a historic region for various, and at times celebrated, undescribed aquatic animals. Watson (2011) differentiated between the legendary "water horses" associated with lakes, and the "kelpie", reportedly found in rivers. Generally, the serpentine, equine-headed water horse has been reported in the proximate ocean, lakes, rivers, and streams of the British Isles, as well as Scandinavia and elsewhere in mainland Europe, whereas the horse-headed kelpie is reported in both Scottish lakes and rivers, and particularly in swift streams (Eberhart, 2002).

Prominently, "Nessie" of Loch Ness, Scotland, has been described as a long-necked, humped animal with a head often indistinguishable from the neck, and, alternatively, as a serpentine animal with a head equine in appearance. Although Bauer (2002b) noted in his examination of the 1960 Dinsdale film evidence of the alleged animal paddling with limbs/fins at the sides, multiple other observations have reported locomotion produced by the tail, which, perhaps supportive of the author's proposal, has also previously been reported as bilobate (Costello, 1974). Kojo (1992) proposed Nessie to be a diurnal animal based on an analysis of observation time distribution, whereas Watson (2012) suggested Nessie may be more likely to venture onto land nocturnally.

Additionally, there are the humped, fork-tailed animals of Lough Fadda, Ireland, a 10-m-long, multiple-humped serpentine animal observed in Loch Morar, Scotland, the serpentine animal confined to a culvert proximate to, and between, Lough Crolan and Lough Derrylea, Ireland, the unknown animal trapped under a bridge in a stream in Ballynahanich, Ireland until rain

and rising water levels helped the animal to escape, and the 3-m-long animal crossing a roadway with "swaying" undulations by Sraheens' Lough, Ireland (Champagne, 2007).

Other animals similar to those referenced include undescribed, freshwater animals reported in continental Europe (particularly Scandinavia), Africa, southeast Asia, Russia, Japan, Australia, and South America.

RESULTS

The author examined the generic descriptions of 163 unidentified freshwater, or suspected euryhaline, aquatic animals. Summaries of the data amassed by him are presented in this paper's Appendix. Approximately 38% of the descriptions estimated the size of the unidentified animal. Reported, general sizes overlapped in class with 3% of all sightings of an unidentified freshwater animal describing a size less than 3 m total body length (TBL). 26% of all sightings included a reported size of 8-18 m TBL, with 9% of sightings estimating a size in excess of 16 m TBL.

When colouration was specifically reported, 18% of the freshwater animals were described with a dark colouration and 3% with a yellow-orange colouration. When humps were reported, 4% of the types reported only one hump, whereas 18% of the animal types reported more than one visible hump.

Serpentine animals were described in 28% of the freshwater types and with a long-necked description in 15% of the animal types. Specifically described head morphology consisted of 21% of the types reporting a cameloid/equine head (it should be noted here that Paxton, 2010, observed that grey seals *Halichoerus grypus* in the Canadian Maritime provinces were also called "horseheads"). Plated, horizontally-oriented bilobate tails were reported in 8% of the descriptions, a sirenian/pinniped-like body in 8%, a fish-like body in 3%, a crocodilian body in 2%, a large "bulky" body in 2%, and a chelonian-like body in 1% of the types. Flippers were reported in 5% of the types, and legs described in 5% of the freshwater observations. The percentages of the total number of observations of each type of freshwater animal appear similar to the corresponding, or similar, marine types (Champagne, 2007).

The undescribed animals reported from regions and bodies of freshwater, and estimated to be most likely to exist based on previous research and environmental requirements, were compared by description, location type, and seasonal observations. Descriptions included the head, body, and tail. Locations were based on latitude, lake or river environment, direct/ indirect access to the ocean, and seasons of observations. Although some of the previous, general proposals of unidentified freshwater animals may be of relict marine or modern freshwater reptiles, species possibly convergent with a plesiosaurid body plan (Mardis, 2014), fish, cetacean, or long-necked pinniped, each of the generic descriptions of the undescribed freshwater animals compared favorably to the author's marine Type III Multiple Humped Animal proposal (Fig. 5).

Animal	Head	Body	Tail	Size	Latitude	Location	Environment	Season	Time	Ocean Access
Champ	Equine/Snakelike	Serpentine	Fish-like	4-10 m	43-45	Lake	Oligotrophic	Summer	Late PM	Obstructed
Kelpie	Equine	Varied	Varied		55-56	Rivers/Lakes	Varied			Varied
Memphre	Equine	Serpentine		7-10 m	45	Lake	Mesotrophic	Summer		Yes
Nessie	Equine	Serpentine	Bi-lobate	3-7 m	57	Lake	Oligotrophic	Summer	AM/PM	Obstructed
Ogopogo	Equine	Serpentine	Forked	6-23 m	47	Lake	Oligotrophic	Summer	AM/PM	Obstructed
Water Horse	Equine	Serpentine	Whale-like	3-7 m	55-56	Lake/Rivers	Varied	Fall		Varied
Type III	Equine/Cameloid	Serpentine	Horizontally Bi-lobate	3-20 m	40-50	Ocean, Estuary	Marine, Brackish	Summer	AM/PM	Yes
Type I	Reptilian	Plesiosaurid	Singular	3-12 m	30-40	Open Ocean	Marine	Summer	AM	N/A

Fig. 5: Comparative Matrix of Prominent Unidentified Freshwater Animals

All of the compared, representative undescribed freshwater animals were in 100% agreement with the equine, "horse-like" head description of the Type III Multiple Humped Animal proposal. With the exception of the varied body description of the Kelpie, all the compared animals were also in agreement with the serpentine body description of the Type III Multiple Humped Animal, although the animal reported to reside in Lake Memphremagog does not have a report providing a tail description and the Kelpie's tail description is varied. The remaining compared animals were in 100% agreement with the distinctive, horizontally lobed tail and all size estimates were within the size ranges of the Type III Multiple Humped Animal. The representative animals also appear to occupy the same ranges as the Type III Multiple Humped Animal and, with the exception of the autumn movements and observations of the Water Horse, each animal was more likely to be observed in the summer, also in agreement with the Type III Multiple Humped Animal.

The author's generic marine Type I Long Necked Animal proposal was also compared to the generic, unidentified lake animal descriptions. The Type I Long Necked Animal proposal was in agreement in general size with the ranges of Champ, Memphre, Nessie, and the Water Horse, and in partial agreement with the size ranges of Ogopogo. The Type I Long Necked Animals' ranges overlapped Champ's and was temporally distributed similar to Nessie and Ogopogo.

UNIDENTIFED MARINE ANIMAL STUDY REVIEW

In review, the author collected and analysed observational data from over 118 sources to include personal communications, texts, journal articles, field reports, television/news accounts, newspapers, and the worldwide web, resulting in 1247 collected observations of unidentified marine animals. These observations were entered into a spreadsheet for organisation and sorting, receiving an observation tracking number that included the reference source of the report (see Appendix for summaries). Available and extrapolated data of each observation were recorded in a number of areas for analysis.

An observation then received a report description number unique to that observation. The description number includes the assigned observation number and a letter designation

indicating particular elements of the observation. The description number includes the following data if appropriate to the observation: a designation for an actual observation of an organism (as opposed to a wave phenomenon, or water disturbance), a behaviour of note exhibited by the animal, an act of predation observed or implied by the observer, a designation of an observation of a carcase or moribund animal, an observation where the locomotion of the animal was described, an observation by a qualified person (life scientist, or individual familiar with local fauna, etc), vocalisations emitted by an observed animal, an observation of a juvenile animal (as judged by a substantial size difference when in the presence of another animal of the same type, or when compared to the average size of a similar animal), an observation of multiple animals during the same observation, the initial response (interest, fear, etc) of the observer(s), a physical characteristic of note observed on the animal, aggression displayed by the observed animal (either towards other animals or towards the observer), an observation recorded either before or soon after a natural event (earthquake, flood, storm, etc), an observation directly related to a recent event (natural or man-made), an observation recorded in a location of note, and a designation of a capture or photograph (or both) of an observed animal.

The date, time of day, and season (if the date is incomplete) were also entered into the spreadsheet. Seasons in the northern latitudes were designated as Spring: 20 March to 19 June; Summer: 20 June to 19 September; Autumn: 20 September to 19 December; and Winter: 20 December to 19 March. In the southern latitudes, seasons were designated as Spring: 20 September to 19 December; Summer: 20 December to 19 March; Autumn: 20 March to 19 June; and Winter: 20 June to 19 September.

A rating was assigned and recorded for each observation. That rating reflected the quality and accuracy, as determined by the elements of the observation rated for credibility with predetermined criteria (see Quality Control of Data).

The duration, or length of the observation, in addition to the distance at which the animal was observed, was recorded. Longitude and latitude coordinates were estimated from information provided in the reports and recorded. Physical characteristics of the water conditions and parameters from the location of the observation were recorded using general information provided by various texts, unless specifically stated by the observer. These characteristics included depth (National Geographic, 1990), salinity, surface temperature, water temperature (Ingmanson and Wallace, 1985), typical wave and tidal conditions and characteristics, and the predominant current (Couper, 1983), if applicable. Additionally, atmospheric pressure, sea floor morphology, relation to earthquake frequency depth ranges, submarine heat flow, submarine sediment distribution, predominant winds, average wind speeds, mean annual rainfall, water column movement, typical thunderstorm activity, marine biogeographical area, phytoplankton production in the area, zooplankton production in the area, and benthic biomass production in the area, as provided by Couper (1983), the weather conditions at the time of the observation, and the weather conditions three days prior and three days subsequent to the observation were also noted in the dataset, if provided by the observer.

The number of observers per report, their activity at the time of the observation, and their immediate reaction to the observation were also noted. So too was the number of individual animals per observation, in addition to the numerical value assigned to the general type of animal observed.

Initially, an observation was classified with at least one of the following designations/ descriptions derived from Heuvelmans's 1968 list (simplified for brief observations) of unidentified aquatic animals. It would become evident that some of Heuvelmans's animal types were not specific enough for differentiation, essentially allowing for the inclusion of a reported animal into more than one type description. A second evaluation of the observations was then conducted, and additional, more specific descriptions of animal types or variations (or both) were included. The final animal types included the Long Necked Animal, Eel-Like Animal, Multiple-Humped Animal, Unidentified Animal (utilised when morphological details were unavailable and/or insufficient for inclusion into another animal type grouping), Other Type of Animal, Dorsal-finned Animal, Carapaced Animal, Cephalopod, Lizard-like Animal, Multiple-Limbed/Segmented Animal, Digited Animal, and Scaled Snake-like Animal. After the descriptions were determined, the labels were then designated as Type I, Type II, Type III, etc. The physical dimensions of the animal were recorded, in addition to the animal's activity when initially observed, and the animal's response to the observer.

When possible, behaviours, descriptions, and locations were assigned numerical values to aid in the sorting process.

When the complete dataset was recorded (1247 observations), it was sorted by a numerical, credibility rating. Repetition was also checked to ensure that no observation was included in the dataset more than once. The observations were sorted by credibility rating (>=5), with observations under the credibility rating discarded from the final data set and analysis.

The sorted dataset was then graphed (histogram, etc) for each category and compared to current proposals, by referencing the data to existing literature. Patterns and behavioural trends were then established for each type of animal, and, subsequently, patterns specific to a particular geography.

After the evaluation was completed, an abbreviated natural history was developed for the animal(s) types identified. A selected extant species, or, where more appropriate, a species from the fossil record, was examined and compared to increase the accuracy of the proposed natural histories. Comparison with an extinct species was necessary in order to address the theories of other researchers maintaining that the animals may be relict organisms (Mackal, 1980).

QUALITY CONTROL OF DATA

As collected observations may have been old, second or third hand accounts, of questionable authenticity, or a case of mistaken identification, a rating scale was

developed to evaluate and estimate the credibility and usefulness of each observation. It was understood that no evaluation process would be error-free when reviewing all observations. In addition to unanticipated complications, some observations undoubtedly are complete or partial fabrications. Also, the observer may have been sincere in relating the observation, but mistook a type of wave phenomenon or a known species or object for the unknown animal. It was also considered that a false identification may be the result of distance (too great for accuracy, detail, or proper identification), lighting, emotion (fear, etc), duration of the observation (too short for a detailed observation - Andrews, 1935), and/or lack of any qualification (education, experience, etc), to evaluate and describe objectively and accurately what was observed.

Each observation was reviewed and awarded points for an element met from a credibility rating list. A maximum score of eleven points could be awarded for each observation.

One point was awarded for an observation that was reviewed by a competent investigator and found to be credible. The investigator would have been experienced and objective in such observations, and was educated in a life science discipline.

A point was awarded for an observation made by a qualified observer. An observer was considered qualified by being formally educated in a life science, experienced through occupation (i.e. commercial fisherman), or with above-average observational skills.

If the observer provided a detailed account or physical description of the animal, location, animal's activity, or elements of the account (date, duration, weather conditions, etc), the observation was awarded one point. Descriptions such as "a big, snake-like thing" or "it looked like an upturned boat" were not considered detailed descriptions.

An observer with a known reputation for veracity, or with an occupational or societal position that may suffer or be lost if the observer were linked to a fabrication, was also taken into account. Consequently, the observation was awarded one point for the potential credibility of the observer(s).

If an observation was documented as simultaneously witnessed by more than one individual, it was awarded one point. It was assumed that if more than one observer witnessed the event, the opportunity for exaggeration or fabrication would have been reduced.

Through personal field experience with brief observations (and later verified by video) of similar sized animals (great white shark *Carcharodon carcharias,* Californian sea-lion *Zalophis californianus,* northern elephant seal *Mirounga angustirostris,* Steller's sea-lion *Eumatopias jubatus,* harbour (common) seal *Phoca vitulina,* killer whale *Orcinus orca,* blue whale *Balaenoptera musculus,* grey whale *Eschrichtius robustus*, etc) made at a distance on the surface by the author, it appears that there could be a maximum distance that an observer may provide a valuable, accurate narrative with the unaided eye. The author's personal experience provided an effective observational distance with unaided

eyesight, at approximately 62 m. An observation made at or under this distance was awarded one point.

The longer the observation, the more accurate and detailed an observation could be expected. The likelihood of misidentification may also be reduced. An observation of 60 seconds or more was awarded one point.

If an observation included tangible, physical evidence (carcase, tissue samples), it was awarded two points.

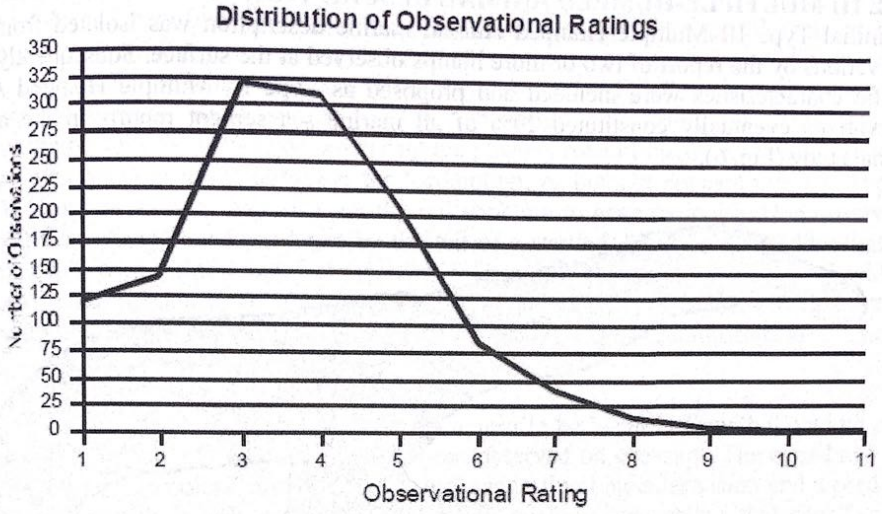
A photograph, film, video, or sonar reading helped to substantiate some observations. As a result, an observation that was documented by photographic evidence, verifiable sonar reading, or both was allowed one point.

Biogenic structures (changed landscape, prints, damage to involved objects, etc) further substantiated an observation. Observations with such corroborating data were awarded one point.

A value of five points was initially decided as the minimum standard for an observation to be included in the final data set. By using this benchmark, it was assumed that an observation would have more probably occurred. All observations received one point. By design, most observations fell under the tolerance of five points and were excluded from the final data set. It is understood that even if a point was awarded for a particular category, this award does not necessarily indicate that the category's strength was individually sufficient to substantiate an observation. This point system was designed to be used in totality, as no single category was intended to stand alone as corroboration.

QUALITY CONTROL RESULTS

After the sort by credibility rating, 358 observations (29%) remained from the original data set of 1247 observations. There was one observation with a credibility rating of eleven points. There were no observations with ten points, and four observations with a credibility rating of nine points. Fourteen observations were recorded with eight points, and thirty-eight with seven points. Eighty-two observations were awarded six points, and 209 received the minimum of five credibility points.



Graph 1: Distribution of Observational Ratings

The distribution of all observations (N=1237) by credibility rating score, with a mean score of 3.686, and a standard deviation of 114.782

Of those observations discounted from the data set, 309 received four points, 320 received three points, 142 received two points, and 118 received one credibility point.

Initially, the minimum credibility rating score was theorised to be five points. It was presumed that an observation with this minimum score would more than likely have taken place with a reduced opportunity for deception, misidentification, or both. Statistical analyses were completed from the observational data. To assist with subsequent research and comparison, t tests, z scores, and a Level of Significance One-Tailed Test were completed to evaluate the minimum retention score, and sensitivity of five.

Observations with a credibility rating of one did not meet the significance criteria. Observations with a credibility rating of two were significant to .0005. Observations with credibility ratings of three and four were not significant. Observations with a credibility rating of five were significant to .001, with observational credibility ratings of six, seven, eight, and nine significant to .0005. There were no observations with a credibility rating of ten, and one observation with a credibility rating of eleven, with an associated significance to .005.

A consistent, observational threshold appears to begin with observations rated for credibility with a score of five points, and in agreement with the original theory of a minimum standard of five points.

TYPE III MULTIPLE-HUMPED ANIMAL DESCRIPTION

The initial Type III Multiple Humped Animal marine description was isolated from other observations by the report of two or more humps observed at the surface. Subsequently, more specific characteristics were included and proposed as Type III Multiple Humped Animal observations eventually constituted 29% of all marine sea serpent reports in the author's original study (Fig. 6).

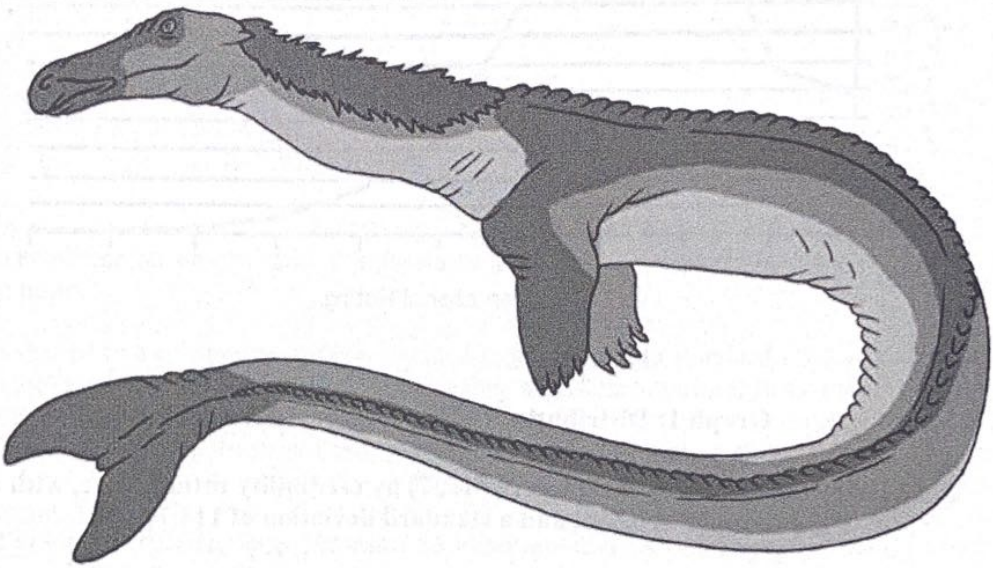


Fig. 6: Type III Multiple Humped Animal (© Tim Morris)

Using a classification matrix, the Type III Multiple Humped Animal scored between plesiosaurs and primitive mammals. The Type III Multiple Humped Animal appears to attain a maximum length of 60 m TBL, with the size class of 10-20 m TBL most commonly reported. The diameter of the body is 3-10% of the TBL and cryptically coloured, possibly indicating adaptation to foraging along a dark substratum while minimising a presence to potential predators and/or absorbing the available solar heat at the surface. The skin is smooth in appearance and texture and may also possess an erectile dorsal spine arrangement. Depending upon the viewing angle of the observer(s) and the available light, small spines (often described as yellow in appearance) may appear as a hair-like skin. It is possible that the Type III Multiple Humped Animal uses this skin system to gain a purchase and maintain its position on slippery rocks, substrate, or both during feeding in a wave-swept environment or while basking on land.

There are two pectoral fins or appendages positioned approximately 30% of the TBL from the head. A dorsal crest or scutes are present, and a mane has been observed on occasion and on animals as small as 3.0 m TBL.

The distinctive bilobate tail is horizontal in orientation, and "plated" along the dorsal surface. It appears the tail may be retracted or withdrawn to create a minimal profile, thus reducing drag in selected environments and situations, or on the recovery stroke of the swimming motion, or both. The tail's appearance, perhaps because it superficially resembles a crustacean telson, has been described as "shrimp-like" or "lobster-like". This rigid tail structure may be used as a support for the soft-rayed tail during the power stroke of the tail's swimming motion, when gaining a purchase on substrate for locomotion, or both. It appears that the Type III Multiple Humped Animal may also use the tail structure to generate noise. One observation described the rattling sound produced by the tail of a startled, basking animal like that of a "Gatling gun", with an additional observation referencing a "vibration" associated with the unknown animal (Champagne, 2007). Perhaps, the animal employs the vibrating or "rattling" tail to warn potential rivals or predators of the animal's presence, to demonstrate aggression, or both.

The equine or cameloid head length dimensions appear to be 5-7% TBL, with the width of the head at 3% of the TBL. Ears or horns have been observed on occasion. The eyes have been described as green in colour, and forward facing, suggesting binocular vision and a predatory strategy. The mouth is sub-terminal to ventral in position, suggesting that the Type III Multiple Humped Animal exploits feeding opportunities primarily at or near the sea floor (Nikolsky, 1978). The teeth have been described as fish-like and sharp with a palate that appears to be textured, possibly serving as an organ for crushing or securing prey in the mouth (Storer *et al.*, 1979), an adaptation for vomerine teeth, or a natrial gland for salt excretion/ regulation. A tongue has been observed, and was described as long, rigid, and "spear-like". Perhaps the structure of the tongue allows the Type III Multiple Humped Animal to impale and retrieve prey from small crevices. Large, prehensile lips have also been reported. These lips may aid the animal in browsing and removing plant material or small food items from crevices and difficult-to-access substrata by providing a tactile and/or suction advantage. The aerial senses of the Type III Multiple Humped Animal appear to be limited, but observations suggesting enhanced, sub-surface visual and auditory senses have been recorded.

The Type III Multiple Humped Animal is likely to be solitary in nature, and may only be found in the presence of conspecifics during breeding season. It has also demonstrated a form of territoriality or aggression towards other species (*Zalophus californianus*), possibly as potential or perceived rivals during mating, or competitors to the available food supply.

The Type III Multiple Humped Animal has been identified with 2-30 humps at the surface of the water, with three being the most frequently reported number, and it appears capable of swimming in excess of 10 km/h. When the animal is perceived to be swimming rapidly at the surface, it is always with a humped posture and vertical undulations. The hump directly behind the head has been described as stationary with the humps following it apparently undulating. LeBlond and Bousfield (1995) proposed that *Cadborosaurus willsi*, a similar animal reported from the waters of Cadboro Bay on Vancouver Island, western Canada, assumed a humped position to approximate more closely the body shape of a fast-swimming thunniform, therefore assuming a more efficient swimming body plan. When the animal is observed basking, floating motionless or swimming slowly, its body is usually extended.

It appears that the Type III Multiple Humped Animal is behaviourally oriented towards the air-water interface, with head displays (spy-hopping [SH] and periscope behaviour [PB]) constituting 49% of all recorded observations. It is possible that these behavioural displays, in the absence of visible humps, have caused the Type III Multiple Humped Animal to have been misidentified as a Type I Animal (Long Necked Animal) on occasion (Fig. 7).

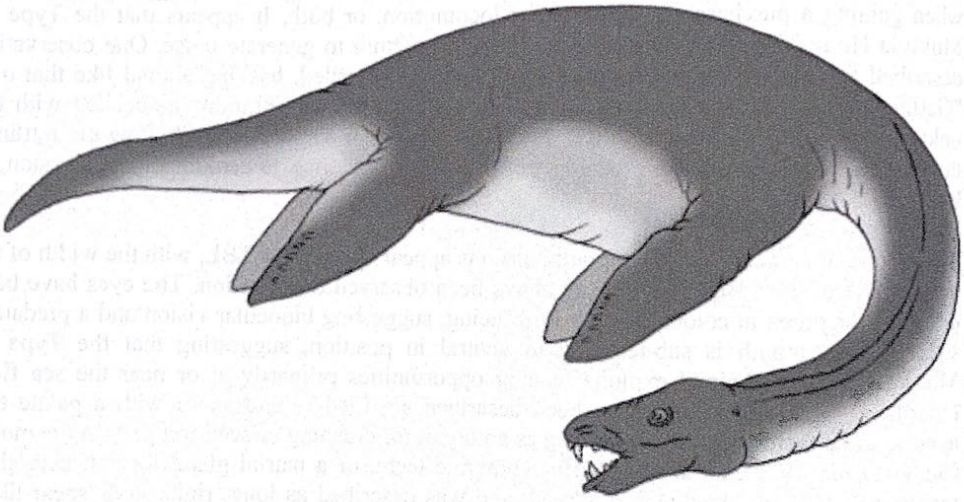


Fig. 7: Type IB Long Necked Animal (© Tim Morris)

Type III Animals appear to migrate daily towards the shore or inland waterways after 00:00 hours and under the cover of darkness. The animal then returns off-shore, possibly into the open ocean, before 06:00 hours.

Although the Type III Multiple Humped Animal has been observed in both hemispheres, it is more frequently reported in the northern hemisphere (90% of observations), with a preferred range of 40-50° latitude. The data suggests this type's preference for the temperate waters over and proximate to the continental shelf, and the boreal air temperatures of shallow and in-shore waterways.

A seasonal migration has been identified within the Type III Multiple Humped Animal's north-south range. During the summer months, the animal appears to migrate as far as 70° latitude, only to return to proximal equatorial latitudes during the fall and winter months.

The Type III Multiple Humped Animal may give birth to precocial young in the relative protection of inland waterways. Animals observed inland are from the extremes of the larger and smaller size classes (4-30 m TBL). With the observation of smaller size-class animals in the higher latitude ranges, it was proposed that a Type III Animal may mate and give birth in

these more fertile areas in order to maximise the growth rate and survival of offspring, returning to the lower latitude range only as adults.

In 63% of the total recorded observations, the Type III Multiple Humped Animal was reported in proximity to estuaries or river confluences or both. The majority of observations also included geographical or environmental conditions with a relative nearness to fully or semi-protected shorelines, multiple islands, offshore banks, and/or strong tidal currents. In areas where the Type III Multiple Humped Animal has been reported with greatest frequency, large and productive estuaries, or river confluences, or all of these features were in the immediate vicinity. The animals observed more than 5 km inland, were at times observed on mud flats and basking on exposed banks.

The Type III Multiple Humped Animal has been reported in fresh or brackish water, and appears to have a preference for seawater of less than 33% salinity, likely venturing into estuaries, up rivers, or both, as observed with the large animal in observation #259 of the author's study of undescribed marine animals (Champagne, 2007). There are more observations of the Type III Multiple Humped Animal swimming up rivers and tidal areas against the outgoing tide, as opposed to movements with tidal movements. Perhaps the Type III Multiple Humped Animal exploits the more concentrated prey organisms or the more exposed prey organisms (or both) for feeding opportunities offered by the lower water levels of the receding tides. The Type III Multiple Humped Animal may also have the capability to move over land for short distances. Alternatively – or additionally - it may not hesitate to negotiate marshes when conditions permit.

Typically, the areas of the reported observations were of a high (>250-500 $mgC/m^2/d$) phytoplankton production, moderate to high (>50-500 g/m^2) zooplankton production, and moderate (1.0-300 g/m^2) benthic biomass production. When the mouth position and morphology of the Type III Multiple Humped Animal and available food were taken into consideration, it was proposed that a Type III Animal likely preys upon moderately-sized species of zooplankton and benthic bony fishes and invertebrates. Although the Type III Multiple Humped Animal has been recorded preying upon seabirds, it is suggested that surface species may not be the usual or preferred prey items for the animal. Such events may be an automatic predatory strike, or the exploitation of a seasonally-available food source.

The Type III Multiple Humped Animal appears to be comparable to an animal observed and recorded from many locations throughout the world (Eberhart, 2002). When a comparison of some of the more frequently reported and similar animals to the Type III Animal is made, it appears that the animals are likely members of the same genus and/or species (*Cadborosaurus*, the Great New England Sea Serpent, U.K., and Indochina).

TYPE III MULTIPLE HUMPED FRESHWATER ANIMAL

Although more than one type of unidentified animal could be the source of lake monster sightings and legends, the author suggests that the most likely candidate for unidentified inland freshwater animals is the Type III Multiple Humped Animal or variant. Theorised and

observed behaviours, distributions, environmental requirements, and reported descriptions of the marine Type III Multiple Humped Animal are supportive and in agreement with the elements of multiple freshwater reports, historical artifacts, and legends. Resident, migrant, and transient variations of this proposed animal may be compared to not only the more noted freshwater bodies, but also the less frequently reported lakes, rivers and streams, bogs, and swamps. Additionally, the author suggests that this type proposal may answer the varied arguments suggested against (or limiting) the existence of lake monsters generally.

Among the arguments against or as a restriction of types are those of a prohibitive climate, water temperature, or both. Although more than one researcher, including the author, has suggested that the Type III Multiple Humped Animal or variant is reptilian, the colder climates of some environments and water would presumably be environmental barriers to the existence or range of this type of animal, even though this particular animal appears to be most frequently reported in these areas, based upon the provided descriptions and behaviours (Champagne, 2007).

However, both the fossil record and known, extant species appear to provide precedents for aquatic reptile tolerance of cooler or cold water temperatures and environmental conditions. After examining polycotylid plesiosaur fossils from non-marine deposits in the Hauterivian-Aptian Formation, Vavrek *et al.* (2014) suggested that not only did these animals, of various size classes and age groups, inhabit high latitudes with seasonally cool temperatures, but also they may have ventured periodically into freshwater environments. Kear (2005) examined the fossils of three families of plesiosaur (Elasmosauridae, Polycotylidae, and Pliosauridae) and possibly one family of ichthyosaur from the White Cliffs deposits of southeastern Australia, and found that these fossils were located in association with palaeoclimatic indicators suggesting seasonal, very cold to near freezing conditions.

Seymore (2004) suggested current evidence supports a hypothesis that ancestors of crocodilians were endothermic, based on their four-chambered heart, thus providing the ancient reptiles with the physiological capabilities associated with the metabolic rates and temperature tolerances of endotherms. Another function of the associated, high systemic blood pressure is support to an extended, vertical blood column above the heart. Such a capability would not only allow a physiologically similar animal to exploit temperate to cold environments, but also provide the required support for the reported spy hopping and periscope behaviours demonstrated by the Type III Multiple Humped Animal. Other recent and supportive research has also suggested that ancient marine reptiles were capable of maintaining high body temperatures independent of the water temperature, even in cold and temperate environments (Bernard *et al.*, 2010).

Perhaps a Type III Animal is endothermic, with the ability to hold and regulate a thermal gradient (Bostron, *et al.*, 2010), or is gigantothermic, with a body size sufficiently large for internal temperature to be minimally affected by the environment. The Type III Multiple Humped Freshwater Animal may have a temperature tolerance similar to other aquatic reptiles. American alligators *Alligator mississippiensis* have been monitored, with no apparent physical distress, in temperatures as low as 7°C (Colbert *et al.*, 1946), and are known to

display an "icing response" when their aquatic environment freezes and the animal is essentially contained under the surface ice, exposing only its nostrils above the frozen surface (Brisbin, 1982). Also cold tolerant, the painted turtle *Chrysemys picta* is known to hibernate in the mud at the bottom of a pond during the winter, and may even emerge to bask on some warmer winter days (Ernst and Lovich, 2009).

Some freshwater bodies reportedly containing unidentified animals are covered with surface ice during the winter. Such a challenging environmental condition would presumably also prevent an air-breathing animal from permanent residence in the lake. Perhaps because a Type III Animal is possibly capable of overland travel, the animal may not remain in a freezing lake or river. Instead, the animal may move to another body of water or a coastal environment, or remain on land with minimal metabolic activity. Alternatively, the lake animals may remain in a frozen body of water, breathing from specialised adaptations (Mardis, 2014) or available air spaces under the ice, perhaps similar to the suggestions Smith and Horonowitsch (1987) made regarding harbour seals *Phoca vitulina* in the Hudson Bay drainage, or the "icing response" of American alligators.

Another argument against a reptilian identity is that the Type III Multiple Humped Animal's observed vertical flexure is more consistent with mammalian movement. Again, however, the fossil record and examples of extant species do provide precedents and demonstrate vertical flexure among the reptiles. After examining the cervical vertebrae of elasmosaurs, Zammit *et al.* (2008) estimated that these extinct animals had approximately 75-177° flexure in the ventral plane and approximately 87-155° flexure in the dorsal plane. Following his examination of a fossil juvenile pliosaur, Kear (2007) suggested that the steeply angled zygapophyseal articulations on the cervical vertebrae suggest a capacity for vertical movement in the neck. Certainly, modern monitor lizards, turtles, and snakes exhibit recognisable vertical flexure.

Cetacean locomotion is aided by a two-joint system that allows the fluke to be moved independently from the anterior tail. The first joint occurs behind the lumbar region, which is stiff due to the presence of dorsal and ventral ligaments. These ligaments terminate in the anterior tail, giving flexibility to this region. The second region of flexibility is created by large intervertebral spacing and convex articular surfaces (Rommel, 1990). Both of these joints increase the flexibility of the tail along the sagittal plane. Similar two-joint systems, with flexibility provided by different adaptations to the axial skeleton, have been identified in scombroid fishes, such as the swordfish *Xiphias gladius* (Fierstine and Walters, 1968), and in lamnid sharks (Reif and Weishampel, 1986). In these animals, however, flexibility is increased along the horizontal plane.

A significant portion of the vertical flexure argument of the Type III Animal's reptilian classification appears to be associated with the vertical undulations reported in the swimming motion and the horizontally lobed tail. The animal has been observed with the body oriented in vertical loops, or humps, and when the swimming motion has been described, the first hump directly behind the head is reported to remain relatively static (Champagne, 2007). Interestingly, historical accounts of the unidentified animal in Loch Ness describe a surface

swimming motion with a changing profile of single to multiple humps, or no undulations visible at all (Costello, 1974). The author (Champagne, 2006) has stabilised a video recording of what appear to be multiple specimens of the Type III Multiple Humped Animal in a possible lekking area in San Francisco Bay, and noted that the multiple humps of fully extended animals did not appear to undulate and maintained their relative positions.

After reviewing the observations by Buffetaut (1983) of the similarity between the vertebrae of modern whales and Jurassic marine crocodilians, LeBlond and Bousfield (1995) suggested that vertical spinal flexure may not be sufficient as a unique, classification characteristic of mammals. Perhaps the animal does not swim with sinuous undulations, but instead remains moderately rigid except for the jointed tail region, with visible humps only providing the appearance of vertical undulation.

Coleman and Huyghe (2003) proposed that small and shallow lakes may be too hot, too polluted, would not provide enough food, do not have sufficient water year round, and can be man-made, obstructed, or both, and are therefore less likely to support "monsters". Such arguments are sound and common as they are applied to an animal with a limited or specialised diet and environment. Certainly, if the undescribed animals were mammalian, their higher metabolic rates would require supportive feeding opportunities and increase their potential visibility, and, by extension, exclude them from consideration in smaller or less optimal bodies of water. Frequently, observations imply any proposed animal would be exclusively piscivorous, although similar, unidentified marine animals have been observed eating birds and small invertebrates (Costello, 1974; LeBlond and Bousfield, 1995; Kirk, 1998; Champagne, 2007). Watson (2013) has discussed the possibility that land sightings of Nessie may be the result of that animal leaving the water to ambush and prey upon deer, but he also listed observations of animals similar in appearance to the Type III Animal eating plants and possibly algae. Others have suggested that proposed, similar animal types may filter particulates from the water column or mud (Mackal, 1976) or maintain a varied diet (Mardis, 2014).

Whereas Mangiacopra (1992) estimated populations of the more commonly reported unidentified lake animals as residents, he and others (Shuker, 1996; Burchfiel, 2012) also allowed for migrant populations. If populations of inland water animals were (or included) transient or migrant members, arguments against acceptable or consistent water quality or conditions, and standing food stocks have less significance on an animals' potential presence when allowing for conditional or seasonal movements. Perhaps, these animals move from marine environments, or between freshwater streams, ponds, or lakes, to winter, birth, and/or exploit seasonal feeding opportunities. In these circumstances, the animals may feed minimally, specifically, or not at all.

Additionally, like the marine Type III Multiple Humped Animal proposal, the sub-terminal to ventral mouth position suggests that the animal feeds primarily at or near the substrate. The Type III Multiple Humped Freshwater Animal may primarily graze on any combination of aquatic plants, algae, benthic invertebrates and fishes, and their substrate-attached or oriented

eggs, larvae, and fry. Possibly the animal also comes out of the water to graze on terrestrial plant material or forage for terrestrial organisms.

Historic reports and surveys occasionally imply an amphibious capability to some unidentified freshwater animals (Costello, 1974; Eberhart, 2002; Watson, 2011). Kojo (1991) acknowledged the physical barriers or impediments to presently-unknown freshwater animals' movement, but also left open the possibility that some animals are capable of overland travel and could potentially negotiate obstacles. Shuker (2012) suggested that the undescribed animals observed in Irish loughs and Scottish lochs are temporary residents, likely moving from one body of water to another.

Obviously, for such animals to move between bodies of water their body plan must provide for minimal water levels or terrestrial locomotion. The Type III Multiple Humped Animal appears to have such a capability, based on reported marine and inland observations, having been observed out of the water and in sloughs and shallow water estuaries more than 5 km inland - more frequently than the proposed plesiosaurid body plan.

The Type III Multiple Humped Animal swims and moves with variable, vertical undulations of its tail, possibly providing a minimal profile to any predator or potential observer when travelling overland or through smaller waterways. Reduced (and possibly rayed or jointed) pectoral appendages may allow for negotiating relatively narrow spaces and waterways, as opposed to movement with horizontal undulations, rigid appendages, or both. The tail is distinct and an identifying feature of the type (Fig. 8).

This horizontally-oriented, rayed tail not only provides the propulsion required for open water swimming, as previously proposed, but also may provide an anchor or contact point in terrestrial or shallow water travel. The plated tail may allow the rayed fins to collapse or adjust, and provides a structural support that the animal may push against in order to move through smaller spaces and reduced water levels when swimming is not advantageous or possible. This mode of movement may perhaps be similar to snake concertina locomotion. Possibly supportive, the MacLellan and Grant land sightings of the animal associated with Scotland's Loch Ness displayed "fanned out" rear legs underneath the animal, "seal-wise", and a loping movement similar to a sea-lion (Costello, 1974). As the Type III Multiple Humped Animal has been reported to make a rattling noise or vibration with its plated tail, perhaps the noise is also the source of the purported and disputed echolocations recorded in Lake Champlain, and the "tapping" and "clicking" noises reportedly associated with Nessie in Loch Ness. An extended, semi-retracted, or collapsed tail may also provide any variation in descriptions of the tail during observations.

The serpentine, horse-headed Water Horses of the British Isles reportedly live in oceans, lakes, rivers, and streams, and are observed most frequently in November, leaving a "slimy trail" on land, whereas the Kelpies were believed to cause their home lakes to swell and flood. Additionally, the long-bodied South American minhocão is believed to make water channels with its terrestrial movement, and the "monstrous snake" of the Greek Kafyes marshes was thought to have excavated trenches and left trails in areas where it passed (Vembos, 2014).

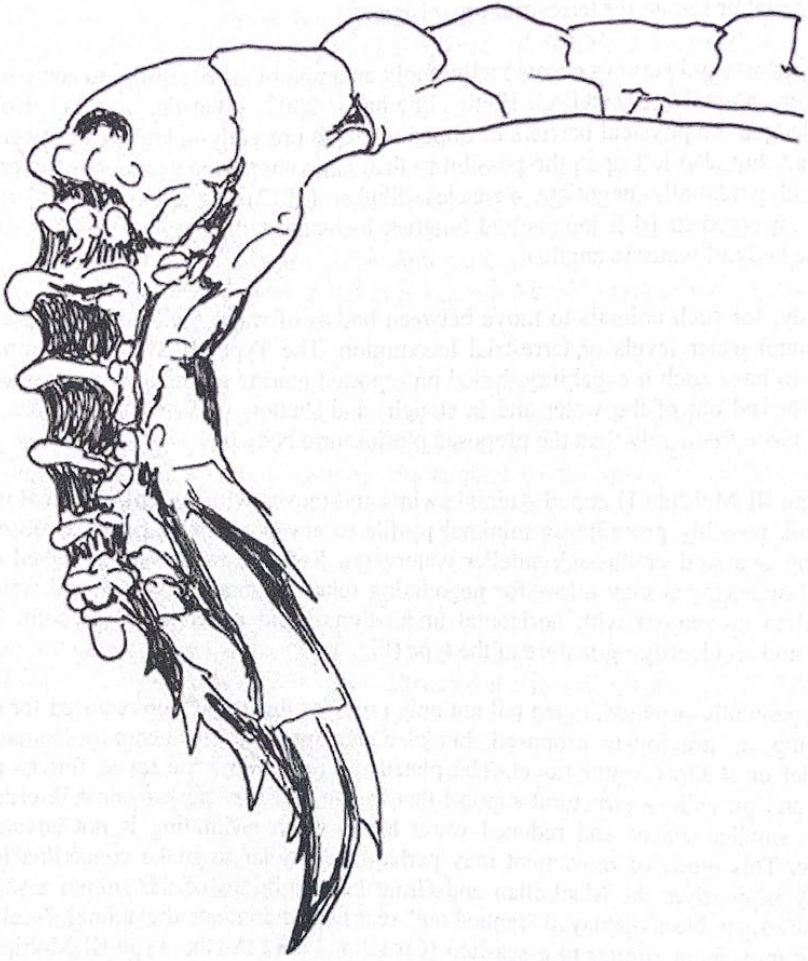


Fig. 8: Type III Multiple Humped Animal tail structure (© Darren Naish)

Similar, unidentified freshwater animals from Siberia, Africa, China, Malayasia, France, Italy, Norway, Sweden, Poland, and Switzerland have also been reported (Eberhart, 2002).

The examination by Watson (2012) of Nessie land sightings noted February as the most frequent month for observations, comprising 25% of all reports where the month is known. Although Watson (2013) advised tnat he has found no correlation between wet weather and land observations, reports have included similar inland animals becoming trapped in culverts and low-volume streams. Perhaps the animal is not the legendary source of flooding and channels, but evidence that the animal is more likely to attempt transiting areas during the rainy season or periods of high water and flooding through existing or seasonal waterways. Such movements may also provide seasonal access to potential mates, and provide for sustainable population distributions.

Other statements against the existence of unidentified lake animals suggest such animals should be observed and reported more frequently (Radford and Nickell, 2006), although Bauer (2002a) argues that even the most frequently "researched" bodies of water have not been surveyed to the thorough extent that critics may suppose. Such critical arguments appear to assume a describable, measurable, or known rate of observational effort, although the author is only familiar with informal assumptions. This unsupported, observational argument would hinge on the number of observers watching and paying direct attention to the entire surface at all times, having the visual acuteness and proximity to recognise unusual surface disturbances or other events, and then to recognise and report or clearly photograph the event. Such a proposal may be based primarily on an animal that regularly disrupts the surface for respiration or some other surface-oriented behaviour.

Certainly, if such animals were cetaceans, one may expect to see and hear exhalations at the surface. Whereas cetaceans may exhale audibly and visibly, pinnipeds and sirenians may surface and breathe unnoticed (Riedman, 1990), with just their nostrils exposed, although pinnipeds also haul out on land for periods of time. If the proposed animals were reptilian, as with the Type III Animal proposal, one might not expect to observe the animal breathing at the surface commonly, as evidenced by the minimal, visible exposure at the surface of modern reptiles like snakes, turtles, and crocodilians.

TYPE III MULTIPLE HUMPED FRESHWATER ANIMAL VARIANTS

The author proposes that the Type III Multiple Humped Freshwater Animal could be differentiated into at least three variants, one of which may also include the marine form (Fig. 9). A "resident" form may be possible in environments with relatively stable resources and levels of competition and predation. These environments may also provide for and require a comparatively larger, somatic body size, generalised feeding strategies, slower metabolism, and greater temperature tolerances. Any resultant low genetic diversity could be addressed if these resident animals had breeding roles, with only a minimal number of individuals actually mating, or with another variant. Perhaps this form has become behaviourally differentiated in response to human activity or a specific environment, as noted between morphologically similar types with dissimilar temporal behaviours.

VARIANT	POPULATION	RESOURCES	COMPETITION	PREDATION	MISCELLANEOUS
Resident	Stable	Stable	Stable	Stable	Medium sized, overland movement not required
Transient	Variable	Variable	Variable	Variable	SM-MD body size/type allows for overland movement
Migrant	Variable	Predictable	Variable	Stable	MD-LG size/type allows for some overland movement
Estuarine	Variable	Stable	Variable	Variable	Some restriction in body size and type
Isolated Lake	Stable	Stable	Stable	Stable	Body size/type less restricted
Unrestricted River/Lake	Variable	Variable	Variable	Variable	Restriction in body size and type

Fig. 9: Comparison of Type III Freshwater Animal Variants

A second variant, a "migrant" form, would naturally have varied distribution, dependent on temporal and spatial conditions, as the animal travels to exploit seasonal or cyclical conditions, limited or specific feeding resources, or areas with increased mating opportunities. Under such circumstances, intraspecific competition could be expected to be variable, and at times potentially high. Levels of predation could also be high, depending on the significance of the event, resource, or point of migration; although a diluting effect may also be provided by the increased number of conspecifics in a specific area. A migrant variant could have a reduced body size that would allow for varied movements, both terrestrial and aquatic, in order to realise migratory objectives. However, some natural or man-made environmental features may limit unrestricted aquatic movements and habitats. Perhaps the Type III Multiple Humped Freshwater Animal migrant variant is more closely related to the marine type.

Possible lekking areas are regularly reported for morphologically similar animals off the northern west coast of North America and the British Isles, with similarly described animals reported more than 5 km inland, when access from a marine environment has not been restricted (Champagne, 2007). As this variant may move from marine to brackish and freshwater environments, additional arguments against this variant's reptilian assignment have included the observation that mammals are far more euryhaline than reptiles. Again, the fossil record and an examination of extant reptile species provide precedents in response to this argument.

Multiple species of extant crocodilian (estuarine crocodile *Crocodylus porosus,* Nile crocodile *Crocodylus niloticus,* American crocodile *Crocodylus acutus,* Orinoco crocodile *Crocodylus*

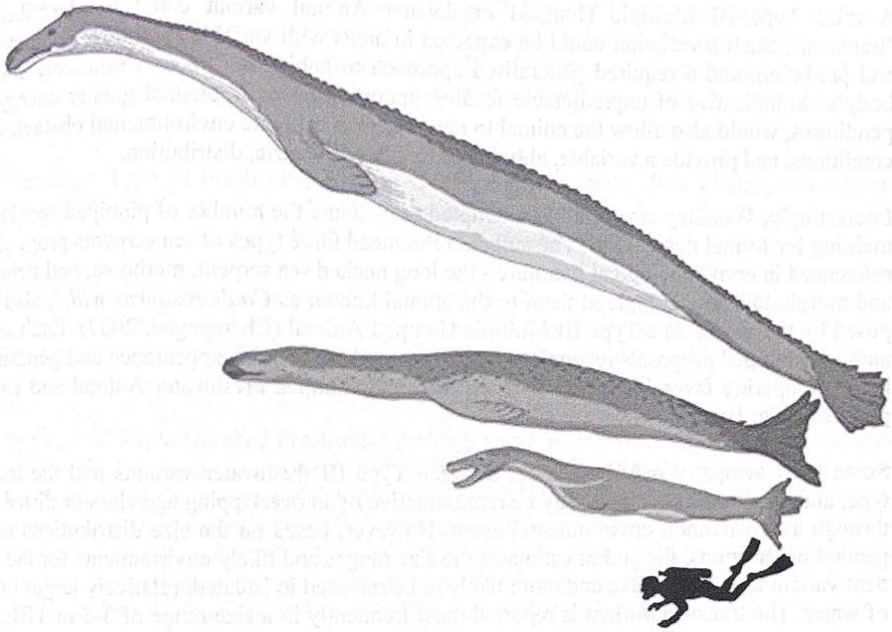


Fig. 10: Three possible still-undiscovered pinnipeds (© Michael Woodley *et al.*)

intermedius, Indian mugger crocodile *Crocodylus palustris*), the diamondback terrapin *Malaclemys terrapin,* Asiatic river snakes of the taxonomic family Hamalopsidae, monitor lizards (Varanidae), file snakes (Acrochordidae), and even skinks (the mangrove skink *Emoia atrocostata*) are known to inhabit and move between waters of varied or no salinity (Bellairs, 1970). The Eocene fossil record contains multiple, probably aquatic, snake species simultaneously inhabiting marine, brackish, and freshwater environments (Rage *et al.*, 2003). Following an examination of fossils from Mesozoic deposits in the Canadian Arctic archipelago, Vavrek *et al.* (2014) suggested not only that high latitude polycotylid plesiosaurs inhabited near-shore waters, but also that they periodically forayed into freshwater environments. Holmes *et al.* (1999) proposed a new species of plioplatecarpine mosasaur, with supporting deposits, and was suggested as exploiting both estuarine and freshwater environments. Kear (2007) also discussed pliosaur fossils suggesting their simultaneous presence in the marine, brackish, and freshwater environments of the Australian Cretaceous epicontinental seaway. While discussing the rapid evolution and adaptive radiation of mosasaurs, Everhart (2005) suggested that mosasaurs may not only have contributed to the extinction of several shark species, but also provided competition for crocodiles in estuarine and freshwater environments.

A third Type III Multiple Humped Freshwater Animal variant could be described as "transient". Such a variation could be expected in areas with variable resources, competition, and predation, and a required generalised approach to habitat and diet. A relatively smaller body size, indicative of unpredictable feeding opportunities and potential greater energy expenditures, would also allow the animal to negotiate and mitigate environmental obstacles and conditions, and provide a variable, although possibly philopatric, distribution.

Interestingly, Woodley *et al.* (2009) attempted to estimate the number of pinniped species remaining for formal description. The authors referenced three types of sea serpents proposed or referenced in cryptozoological literature - the long necked sea serpent, merhorse, and tizheruk, and morphologically compared them to the animal known as *Cadborosaurus willsi*, also proposed by the author as a Type III Multiple Humped Animal (Champagne, 2007). Each of the authors' pinniped proposals recognised a size class, which have an appearance and geographic range comparing favorably to the Type III Multiple Humped Freshwater Animal and variant proposal (Fig. 10).

Some natal sympatry may be present between Type III freshwater variants and the marine type, and observed individuals may be representative of an overlapping age class or distributed through an uncommon environmental event. However, based on the size distributions of the general descriptions, the author estimates the size ranges and likely environments for the resident variant as 6-10 m TBL, and more likely to be reported in isolated, relatively larger bodies of water. The transient variant is reported most frequently in a size range of 3-5 m TBL, and most commonly associated with unrestricted or minimally obstructed rivers, lakes, and inland freshwater marshes. The migrant variant may be typically assigned to a size class in excess of 10 m TBL, and likely to be reported in relatively larger, unobstructed rivers and lakes.

Reproduction may occur between overlapping variants and/or the marine type, or speciation may have occurred in one or more of the variants. Perhaps similarly, Pittman and Ensor (2003) suggested that the low genetic diversity in multiple forms of Antarctic killer whales (*Orcinus orca*) were the result of rapid and recent divergence from the phenotype- possibly in as little as thirteen generations.

CONCLUSION

Variations of the Type III Multiple Humped Freshwater Animal proposal appear to correspond with the different environments associated with unidentified freshwater animal (or "lake monster") reports. Each variant with its restrictive or supportive body size, behaviour, and morphology appears consistent with reports, descriptions, and the observations of other researchers, local legend, or both.

The author estimated that the marine Type III Multiple Humped Animal attains the largest size, and would likely be found only in inland waterways with direct access to the ocean. The marine variant does, however, appear to maintain some ability to move onto land short distances from the water.

Attaining a TBL size in excess of 10 m, the "migrant" Type III Freshwater Animal variant is relatively smaller than the marine type, but has a body size allowing for more diverse movements, both terrestrial and aquatic, in order to exploit migratory resources, and it is more likely to be a candidate for reports from larger unrestricted or minimally restricted bays, lakes and rivers.

The "resident" Type III Freshwater Animal variant appears intermediate in size, possibly attaining a TBL of 6-10 m. The author proposes this variant to be the probable candidate for unidentified animals in larger, isolated lakes and other freshwater bodies.

Within the 3-5-m TBL size class, the relatively smaller "transient" Type III Freshwater Animal variant could be expected in inland freshwater systems with variable or low flows, or with natural, seasonal, or man-made obstacles. This type variant would most likely be reported in very shallow waterways, and observed with terrestrial movements.

The Type III Multiple Humped Freshwater Animal (and possible variants) proposal compares favorably with the reported, historical, and artistic morphology of both prominent and lesser known undescribed freshwater animals. As the Type III Animal displays activity and agreeable morphology that encompasses most reported behaviours, composite serpentine and plesiosaurid representations depicting long necks, equine-like or cameloid heads, unnatural and inexplicable illustrations of humps, and a fluked tail become unnecessary to account for the varied descriptions, if one considers the Type III Animal and variant proposal.

It was not the author's specific intent to prove or disprove the existence of a particular "lake monster" or type proposal. Rather, by comparing and correlating various candidate proposals, viable population estimates, access, and available resources with the proposed Type III Multiple Humped Animal and variants, a possible natural history and viability can be examined and falsified, maximizing infrequent occasions for observations and limited resources to collect and analyse additional data for eventual specimen procurement, tissue collection, or both..

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APPENDIX

The following figures summarise the data amassed by the author as discussed above.

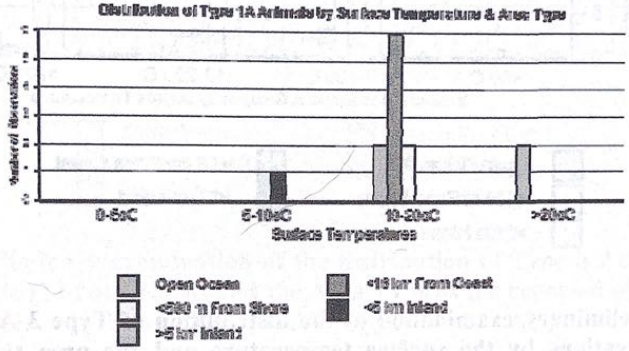

Fig. 11: The preliminary examination of the distribution of Type 1A Animals (Long Neck variation) by the prevailing surface temperatures and designated area type. Each bar contains the total of the observations reported (N=13) (*Crypto-Dracontology Journal*).

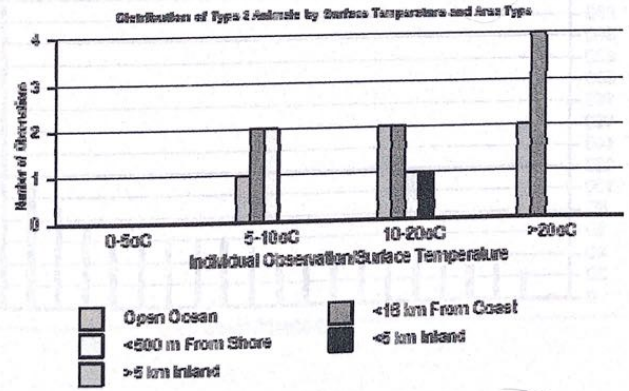

Fig. 12: The preliminary examination of the distribution of Type 2 Animals (Eel-Like) is illustrated by the prevailing surface temperature and area type. Each bar contains the total of observations reported (N=17) (*Crypto-Dracontology Journal*).

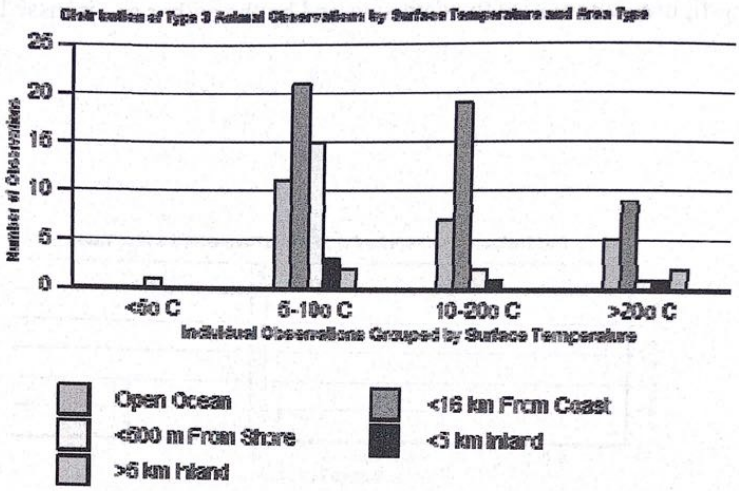

Fig. 13: The preliminary examination of the distribution of Type 3 Animal (Multiple-Humped) observations by the surface temperature and the area type in which the observation occurred. Each bar represents the total of observations (N=99), for that temperature range and area type (*Crypto-Dracontology Journal*).

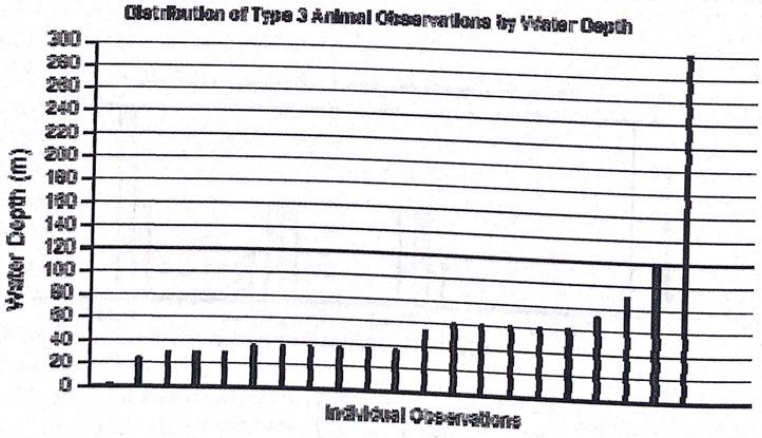

Fig. 14: The preliminary examination of the distribution of Type 3 Animal (Multiple-Humped) observations by the estimated depth in the area the observations occurred. Each bar represents a single observation (N=21). Two open ocean observations are not illustrated. The depths for those observations were 810 m and 4500 m. (*Crypto-Dracontology Journal*).

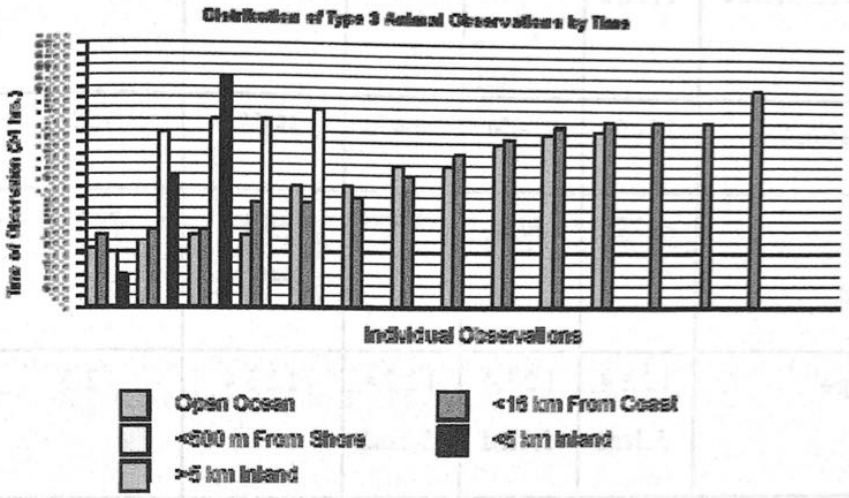
Distribution of Type 3 Animal Observations by Time
Time of Observation (24 hrs.)
Individual Observations
Open Ocean
<16 km From Coast
<300 m From Shore
<5 km Inland
>5 km Inland

Fig. 15: The preliminary examination of the distribution of Type 3 Animals (Multiple-Humped) by Time (24-hour clock) and the Area Type of the reported observation. Each bar represents a separate observation (N=34) (*Crypto-Dracontology Journal*).

OVERLEAF:

Table 1: The preliminary examination of the comparison of *C. willsi*, the Great New England Sea Serpent (GNESS), an unidentified animal observed in proximity to the United Kingdom, countries of Scandinavia, and Indochina. and of the Pacific Northwest, with the Type 3 Animal (Multiple Humped) (*Crypto-Dracontology Journal*).

CHARACTERISTICS	TYPE 3	Cmilli	GNESS	U.K.	SCANDINAVIA	INDOCHINA
Range (latitude)	30-60o	35-60o	30-45o	49-58o	56-71o	24-46o
Season(s) Observed	ALL	ALL	Summer	Summer, Spring	Summer	Summer, Winter
Area Type	1,2,3,4, 5,land	1,2,3,4, 5,land	1,2,3,4, 5,land	1,2,3,4	2,3	2,3,4
Eccritic Water Temp. (oC)	5-20o	5-12o	17.5o	7.5-15o	10-17.5o	10o
Swimming Method	Humped, w/ vertical undulations	Humped, w/ vertical undulations	Humped, w/ vertical undulations	Humped, w/ vertical undulations	Humped, w/ vertical undulations	Humped, w/ vertical undulations
Total Body Length	3-60m	5-15m	3-40m	10-80m	20-80m	20-25m
Head Description	Cameloid	Cameloid	Snake-like	Horse, alligator, snake, fish	Horse, alligator, long, blunt, pointed	Snake, seal
Body Description	Serpentine	Serpentine	Serpentine	Serpentine	Serpentine	Serpentine
Tail Description	Horizontal, pointed	Horizontal, pointed	Horizontal, forked	Forked, spade	Unknown, but emits clapping noise	Unknown
Fin Description	Pectoral only	Pectoral only	2 pair?	"Flappers"	Unknown	Unknown
Dorsal Structures	Serrations, mane	Serrations, mane	Serrations	Serrations	Serrations, mane	Serrations
Type 3 Agreement	N/A	100%	82%	91%	91%	73%